of the brain, yet may be influenced through the brain, the office of which is considered as purely sensorial. The separate existence of these powers is illustrated by a review of the various classes of animals, in the lowest of which we find only the muscular system; in the next above the muscular and nervous without sensorium; and in the most perfect animals we find the three vital powers combined, each having existence not immediately depending on the others, but so connected that no one can subsist long without the others, since all are supported by the same circulation, that is dependent for its continuance upon muscular action, which cannot exist without respiration, while this again depends on the nervous system for its continuance.

Although the heart of a frog retains its power long after the brain and spinal marrow are removed, nevertheless Dr. Philip found that its force may be for a time extremely impaired, by suddenly crushing the brain or spinal marrow, but it will again recover its power after the entire destruction of those parts; and corresponding effects were observed, though not so distinctly, in rabbits.

It is to this cause that the author ascribes the difference between his results and some of those of M. Le Gallois, who, instead of employing a small wire to destroy the spinal marrow, used an instrument which fitted the cavity of the spine, and consequently crushed the marrow more suddenly.

From the whole of his experiments the author concludes, that the involuntary muscles obey the same laws as those of voluntary motion; that the difference arises from their being under different stimuli; that both are liable to be stimulated through the nervous system; that they each have power independent of that system. That what has been called nervous system consists of two parts, one purely sensorial, the other conveying impressions.

That the three powers are combined in the most perfect animals. That the muscular may be destroyed through the nervous system, and the nervous through the sensorial; and though each is not strictly dependent on the others, they are so connected that no one can exist long without the others.

Experiments to ascertain the Influence of the Spinal Marrow on the Action of the Heart in Fishes. By Mr. William Clift. *Communicated by Sir* Everard Home, *Bart. V.P.R.S.* Read February 16, 1815. [*Phil. Trans.* 1815, *p.* 91.]

These experiments were undertaken by the author, in order to ascertain the truth or fallacy of M. Le Gallois' conclusion respecting the action of the heart being dependent on the spinal marrow. For since the death of quadrupeds (on which M. Le Gallois operated) is so readily produced by injury to the vital organs, it appeared to Mr. Clift that fishes would be far preferable, from their being more tenacious of life.

After two or three preliminary experiments on the duration of the

heart's action in carp, after being fully exposed by opening into the pericardium without any injury being done to the brain or spinal marrow, Mr. Clift next passed a hot wire from the tail to the occiput of a carp of the same size, so as to destroy its spinal marrow; and he found that the action of the heart was quickened for two or three beats, but then resumed the same rate of pulsation as before, although the voluntary muscles had lost their power and did not contract when a stimulus was applied to them.

After several repetitions of this experiment, with various modifications in the mode of conducting it, the author arrives at the following results:—

1st. That the muscles of the body of a carp can be thrown into powerful action four hours after the brain and heart are removed.

2dly. That those muscles lose all power as soon as the spinal marrow is destroyed.

3rdly. That by exposure of the heart to water in which the fish is allowed to swim, the action of the heart ceases sooner than in air.

4thly. That whether the heart is exposed or not, its action continues long after the brain and spinal marrow are destroyed; and still longer when the brain is removed without previous injury to its substance.

5thly. That the action of the heart is in general accelerated for a few beats by injuries to the brain or spinal marrow; but that destroying the spinal marrow after the brain has been separated renders the action of the heart slower for a few beats.

Some Experiments and Observations on the Colours used in Painting by the Ancients. *By Sir* Humphry Davy, *LL.D. F.R.S.* Read February 23, 1815. [*Phil. Trans.* 1815, *p.* 97.]

Beside the use which may be made of what remains of ancient paintings as models for imitation, the author has endeavoured to reap the further advantage of making us acquainted with the nature and chemical composition of their colours; for though the works of Dioscorides, Vitruvius, and Pliny contain descriptions of many substances used by the ancients as pigments, it is only by experiment that the subjects of which they speak can be identified.

The author's experiments have been made upon colours found in the baths of Titus, in the ruins called the baths of Livia, and other ruins of ancient Rome, and in the ruins of Pompeii. Some of these colours had been discovered in vases beneath the ruins of the palace of Titus, and were found to be the same as those used in various fresco paintings of the palace. In one large vase, discovered about two years since, there were found, among other colours, three different kinds of red, one approaching to orange, another dull red, and a third purplish red. The first was minium, the second and third proved to be both ochres of different tints. Another red found in various fresco paintings differed from those found in the vase, and proved to be vermilion. This substance, called by the Greeks κιννάβαρι, was known